Claims

1. A method (800) of simulating or designing a communication network supporting communication between a plurality of communication units, wherein the method comprises the step of:

employing (855, 860) a simulation tool (300) to resolve a mathematical formula relating to an operation of the communication network,

wherein the method is characterised by the step of:

resolving one or more iterative mathematical formula in hardware within a hardware platform (320) of the simulation tool (300).

2. A method (800) of simulating or designing a communication network according to Claim 1, wherein the simulation tool further comprises a software platform (310), operably coupled to the hardware platform (320), and utilises a series of mathematical formula at least one of which has no closed form solution, the method further characterised by the step of:

resolving, by the hardware platform, the one or more mathematical formula that has no closed form solution.

3. A method (800) of simulating or designing a communication network according to Claim 2, wherein the method is further characterised by the step of:

providing, by the software platform (310, 315), one or more input signals (330) to the hardware platform (320, 325), relating to the one or more mathematical formula to be resolved.

4. A method (800) of simulating or designing a communication network according to Claim 2 or Claim 3, wherein the method is further characterised by the step of:

configuring the hardware platform (320, 325), by the software platform (310, 315), by setting one or more parameters of the mathematical formula to be resolved, for example, one or more path-loss parameters and/or a parameter in equation $\frac{(E_b/N_0)_{BS\_to\_m}}{C/R_{BS\_to\_m}}$.

5. A method (800) of simulating or designing a communication network according to Claim 3 or Claim 4, wherein the one or more input signals (330) are in the form of an electrically variable signal, for example a voltage level, where a level of the electrically variable signal corresponds to a transmit (or receive) power level of a communication unit operating in the communication network (200).

6. A method (800) of simulating or designing a communication network according to Claim 5, wherein the mathematical formula relate to an air-interface of a wireless communication network (200) having communication units that are capable of transmitting at differing radio frequency transmit powers, wherein the step of resolving comprises the step of converging a number of the transmit powers.

7. A method (800) of simulating or designing a communication network according to any of the preceding Claims, wherein the method is further characterised by the step of:

adapting an operational communication network (200), for example in substantially in a real-time manner, in response to one or more output provided by the hardware platform (320, 325).

8. A method (800) of simulating or designing a communication network according to any of preceding Claims 3 to 7, wherein the method is further characterised by the step of:

simulating a variation of a location of communication units as a function of time by adapting one or more input signal levels.

9. A method (800) of simulating or designing a communication network according to any of preceding Claims 3 to 8, wherein the method is further characterised in that the one or more input signal levels relate to any one or more of the following:

(i) A geographical area to be covered by the communication network;

(ii) A number of subscriber units for which a simulation is to be performed;

(iii) An operational status of one or more subscriber units, for example whether a subscriber unit is mobile or static;

(iv) A power emission level from a subscriber unit and/or base station; or

(v) An operational setting of one or more base station(s).

10. A method (800) of simulating or designing a communication network (200) according to any of the

preceding Claims, wherein the method is applied to a wireless CDMA, TDMA, FDMA or OFDMA communication network.

11. A method (800) of simulating or designing a communication network (200) according to any of the preceding Claims, wherein the method is applied to one or more of the following:

(i) A static simulation of a wireless communication network;

(ii) A dynamic simulation of a wireless communication network;

(iii) An off-line optimisation of a wireless communication network; or

(iv) An on-line (or substantially near-real-time) optimisation of a wireless communication network.

12. A communication network (200) adapted to support the method steps of any of preceding Claims 1 to 11.

13. A communication unit, such as an Operations and Management Centre (OMC) of a 3G communication network, adapted to support the method steps of any of preceding Claims 1 to 11.

14. A storage medium storing processor-implementable instructions for controlling a processor to carry out the method steps of any of preceding Claims 1 to 11.

15. A simulation tool, adapted to support the method steps of any of preceding Claims 1 to 11.

16. A simulation tool (300), for simulating or designing a communication network (200) supporting

communication between a plurality of communication units, comprising a software platform (310), wherein the simulation tool (300) is characterised by:

a hardware platform (320) operably coupled to the software platform (310) such that the hardware platform (320) is configured to resolve one or more iterative mathematical formula relating to an operation of the communication network (200).

17. A simulation tool (300) according to Claim 16, wherein the hardware platform (320) is configured to resolve one or more mathematical formula that has no closed form solution.

18. A simulation tool (300) according to Claim 16 or Claim 17, wherein the simulation tool (300) comprises an interface between the software platform (310) and the hardware platform (320) to enable the software platform (310, 315) to provide one or more input signals (330) to the hardware platform (320, 325), relating to the one or more mathematical formula to be resolved.

19. A simulation tool (300) according to any of preceding Claims 16 to 18, wherein the software platform (310, 315) is capable of configuring the hardware platform (320, 325) by setting one or more parameters of the mathematical formula to be resolved, for example, one or more path-loss parameters and/or a parameter in equation $\frac{(E_b/N_0)_{BS\_to\_m}}{C/R_{BS\_to\_m}}$.

20. A simulation tool (300) according to Claim 18 or Claim 19, wherein the one or more input signals (330) are

in the form of an electrically variable signal, for example a voltage level, where a level of the electrically variable signal corresponds to a transmit (or receive) power level of a communication unit operating in the communication network (200).

21. A simulation tool (300) according to any of preceding Claims 18 to 20, wherein the software platform (310) adapts one or more input signals (330) in order to simulate a variation of a location of one or more communication units as a function of time.

22. A simulation tool (300) according to any of preceding Claims 18 to 21, wherein the one or more input signal levels relate to any one or more of the following:

(i) A geographical area to be covered by the communication network;

(ii) A number of subscriber units for which the simulation is to be performed;

(iii) An operational status of one or more of the subscriber units, for example whether a subscriber unit is mobile or static;

(iv) A power emission from a subscriber unit and/or base station; or

(v) An operational setting of one or more base station(s).

23. A simulation tool (300) according to any of preceding Claims 16 to 22, wherein the hardware platform comprises a plurality of substantially only two electronic components: adder functions and multiplier functions.

24. A simulation tool (300) according to any of preceding Claims 18 to 23, wherein the interface comprises a plurality of sample & hold functions and 'decoder logic' building blocks.

25. A simulation tool (300) according to any of preceding Claims 16 to 24, wherein the hardware platform is configured to resolve an equation of a form:

$$I_m = \sum_{n=1,n\neq s}^{Nbs} P_n \times \frac{1}{L_n} + (P_s - Pm) \times \frac{1}{L_s} \times a$$

26. A simulation tool (300) according to any of preceding Claims 16 to 24, wherein the hardware platform is configured to resolve an equation of a form:

$$I_m = \sum_{n=1,n\neq s}^{N_m} P_m \times \frac{1}{L_n} + (P_s - P_{m\_to\_BS}) \times \frac{1}{L_s}$$

27. A simulation tool (300) according to any of preceding Claims 16 to 26, wherein the simulation tool is located in an Operations and Management Centre (246) of a wireless communication network (200).

28. A simulation tool (300) according to Claim 16 to 27, wherein the simulation tool is arranged to adapt an operational communication network in substantially in a real-time manner in response to an output provided by the hardware platform.

29. A cellular communication system (200) adapted to employ the simulation tool of any of preceding Claims 16 to 28.

30. A communication system substantially as hereinbefore described with reference to, and/or as illustrated by, FIG. 2 of the accompanying drawings.

31. A cellular communication unit (246), such as an Operations and Management Centre, substantially as hereinbefore described with reference to, and/or as illustrated by, FIG. 3 or FIG. 4 or FIG. 5 or FIG. 6 or FIG.7 of the accompanying drawings.

32. A method of simulating or designing a communication network substantially as hereinbefore described with reference to, and/or as illustrated by, FIG. 8 of the accompanying drawings.